

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 03 JUN 2005

WIPO PCT

Applicant's or agent's file reference <b>TS 6409 PCT</b>	<b>FOR FURTHER ACTION</b> <div style="text-align: right;">See Form PCT/PEA/416</div>	
International application No. <b>PCT/EP2004/050544</b>	International filing date (day/month/year) <b>16.04.2004</b>	Priority date (day/month/year) <b>25.04.2003</b>
International Patent Classification (IPC) or national classification and IPC <b>E21B43/10, E21B7/20, E21B29/00</b>		
Applicant <b>SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V. et</b>		
<ol style="list-style-type: none"> <li>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</li> <li>2. This REPORT consists of a total of 8 sheets, including this cover sheet.</li> <li>3. This report is also accompanied by ANNEXES, comprising:               <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 7 sheets, as follows:                   <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).                    <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.                 </div> </li> <li>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</li> </ol> </li> </ol>		
<ol style="list-style-type: none"> <li>4. This report contains indications relating to the following items:               <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion                  <input type="checkbox"/> Box No. II Priority                  <input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability                  <input type="checkbox"/> Box No. IV Lack of unity of invention                  <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement                  <input type="checkbox"/> Box No. VI Certain documents cited                  <input type="checkbox"/> Box No. VII Certain defects in the international application                  <input type="checkbox"/> Box No. VIII Certain observations on the international application               </div> </li> </ol>		
Date of submission of the demand  <b>21.01.2005</b>	Date of completion of this report  <b>03.06.2005</b>	
Name and mailing address of the international preliminary examining authority:  <div style="display: flex; align-items: center;"> <div>             European Patent Office - P.B. 5818 Patentlaan 2              NL-2280 HV Rijswijk - Pays Bas              Tel. +31 70 340 - 2040 Tx: 31 651 epo nl              Fax: +31 70 340 - 3016           </div> </div>	Authorized Officer  <b>Schouten, A</b>  Telephone No. +31 70 340-4088	



# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/EP2004/050544

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## Box No. I Basis of the report

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

### Description, Pages

1-20 as originally filed

### Claims, Numbers

1-17 received on 19.01.2005 with letter of 19.01.2005  
18-29 received on 23.05.2005 with letter of 23.05.2005

### Drawings, Sheets

1/11-11/11 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 27-29

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 27-29

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☒ See separate sheet for further details

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-21,25,26
	No: Claims	22-24
Inventive step (IS)	Yes: Claims	1-21
	No: Claims	22-26
Industrial applicability (IA)	Yes: Claims	1-26
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

Claims 27-29 contain references to the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 1 Reference is made to the following documents:
  - D1: WO 01/86111 A (HARDING RICHARD PATRICK; TILTON FREDERICK THOMAS (US); HAUGEN DAVID) 15 November 2001 (2001-11-15)
  - D2: US 5.271.472 A (LEATHERN RICHARD E.) 21 December 1993 (1993-12-21)
  - D3: US 2001/0045284 A (SIMPSON NEIL AA; HAUGEN DAVID) 29 November 2001 (2001-11-29)
  - D4: WO 02/38343 A (SIMPSON NEIL AA; HARDING RICHARD P.) 16 May 2002 (2002-05-16)
- 2 CLAIMS 1-18
- 2.1 The document D1 is regarded as being the closest prior art to the subject-matter of independent claim 1, and discloses on page 9, paragraph 2 - page 10, paragraph 1 and in Fig. 5 and 6 (the references in parentheses applying to this document):

A method of creating a borehole (50) in an earth formation, the method comprising the steps of:

- a) drilling a section of the borehole (50) and lowering an expandable tubular element (300) into the borehole (50) whereby a lower portion of the tubular element (300) extends into the drilled borehole (50) section;
- b) radially expanding said lower portion of the tubular element (300) so as to form a casing in the drilled borehole section (50); and
- c) separating an upper portion of the tubular element (300) from said lower portion so as to allow the separated upper portion to be moved relative to said lower portion.

The subject-matter of claim 1 differs from this known method of creating a borehole in that it further comprises the following method step:

- d) lowering said separated upper portion through the expanded lower portion formed in preceding step (b).

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

- 2.2 The problem to be solved by the present invention may be regarded as saving time.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: by lowering the separated upper portion through the expanded lower portion, it does not need to be retrieved to surface so that this separated upper portion can directly be used in the deeper borehole section.

- 2.3 Claims 2-18 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**INTERNATIONAL PRELIMINARY  
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(SEPARATE SHEET)**

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**3 CLAIMS 19-21**

3.1 Since none of the cited prior art documents discloses the subject-matter of independent claim 19, it is considered to be new (Article 33(2) PCT).

3.2 The problem to be solved by claim 19 may be regarded as saving time.

The solution to this problem proposed in claim 19 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: the drilling assembly comprises anchoring means that anchor the drilling assembly in an upper portion of the tubular element after separating said upper portion from a lower portion of the tubular element. This allows for the separated upper portion to be used for subsequent drilling without having to retrieve the upper part to the surface.

3.3 Claims 20-21 are dependent on claim 19 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**4 CLAIMS 22-26**

- 4.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claim 22 is not new in the sense of Article 33(2) PCT.

The document D3 discloses in paragraphs 30-32 and Fig. 6 (the references in parentheses applying to this document):

An expansion assembly (600) for use in the method of any one of claims 1-18, the expansion assembly (600) being operable between a radially expanded mode in which the expansion assembly (600) has a diameter larger than the inner diameter of the tubular element (435) when unexpanded, and a radially retracted mode in which the expansion assembly (600) has a diameter smaller than the inner diameter of the tubular element (435) when unexpanded, and wherein the expansion assembly (600) comprises actuating means (610) arranged to move the expansion assembly (600) from the radially retracted mode to the radially expanded mode thereby expanding the tubular element (435) when the expansion assembly (600) is positioned in the tubular element (435), wherein the expansion assembly (600) further comprises progressing means for axially progressing the expansion assembly (600) through the tubular element (435), the progressing means comprising a connector member for connecting a wireline (615) extending from surface through the tubular element (435), to the expansion assembly (600).

- 4.2 Dependent claims 23-26 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, see D3 paragraphs 30-32 and Fig. 6 and D4 page 12, paragraph 1 and Fig. 10.



C L A I M S

1. A method of creating a borehole in an earth formation, the method comprising the steps of:

5 a) drilling a section of the borehole and lowering an expandable tubular element into the borehole whereby a lower portion of the tubular element extends into the drilled borehole section;

b) radially expanding said lower portion of the tubular element so as to form a casing in the drilled borehole section;

10 c) separating an upper portion of the tubular element from said lower portion so as to allow the separated upper portion to be moved relative to said lower portion; and

15 d) lowering said separated upper portion through the expanded lower portion formed in preceding step (b).

2. The method of claim 1, further comprising repeating at least one of step a), steps a) and b), steps a), b) and c), and steps a), b), c) and d) until the desired borehole depth is reached, whereby:

20 - in each repeated step a) the borehole section is drilled subsequent to the borehole section drilled in the preceding step a), whereby the latter borehole section is defined to be the previous borehole section;

25 - in each repeated step a) the tubular element to be lowered is the upper portion of the tubular element resulting from the preceding step c);

- in each repeated step b) the casing is formed subsequent to the casing formed in the preceding step b),

whereby the latter casing is defined to be the previous casing.

3. The method of claims 1 or 2, wherein in each step a) the tubular element is lowered into the drilled borehole section simultaneously with drilling of the borehole section.

4. The method of any one of claims 1-3, wherein in each step c) said upper portion is separated from said lower portion at a position where the tubular element extends into the previous casing arranged in the borehole.

5. The method of claim 4, whereby said previous casing has a lower end part of enlarged inner diameter compared to the remainder of the previous casing, and wherein said upper tubular element portion is separated from said lower tubular element portion at a position where the tubular element extends into said lower end part of the previous casing.

6. The method of any one of claims 1-5, wherein in each step c) said upper portion is separated from said lower portion by cutting the tubular element, or by unscrewing a threaded connection of the tubular element.

7. The method of claim 6, wherein said upper portion is separated from said lower portion at a location where the tubular element is substantially unexpanded.

8. The method of any one of claims 1-7, whereby each borehole section is drilled using a drilling assembly which is axially movable through the tubular element, and wherein before at least each repeated step a) the drilling assembly is moved downwardly through the through the tubular element to a position whereby the drilling assembly at least partly extends below the tubular element.

9. The method of claim 8, whereby in said position the drilling assembly is releasably connected to the tubular element, and wherein after drilling the borehole section, the drilling assembly is released from the tubular element and moved upwardly through the tubular element to surface.

10. The method of claim 8 or 9, wherein the drilling assembly is moved through the tubular element by means of a wireline extending from surface through the tubular element, to the drilling assembly.

11. The method of any one of claims 1-10, wherein each step b) comprises arranging an expansion assembly in said lower portion of the tubular element, and operating the expansion assembly so as to expand said lower portion.

12. The method of claim 11, whereby the expansion assembly is operable between a radially expanded mode and a radially retracted mode in which the expansion assembly is movable through the tubular element, and wherein the expansion assembly is arranged in said lower portion of the tubular element by moving the expansion assembly downwardly through the tubular element whereby the expansion assembly is in the retracted mode.

13. The method of claim 12 whereby the expansion assembly is arranged to expand the tubular element upon movement of the expansion assembly from the radially retracted mode to the radially expanded mode thereof, wherein the method comprises alternately moving the expansion assembly between the radially retracted mode and the radially expanded mode, and wherein the expansion assembly is progressed through the tubular element during periods of time that the expansion assembly is in the retracted mode.

14. The method of claim 12 or 13, wherein the expansion assembly is progressed through the tubular element by means of a wireline, a tubular string, or a coiled tubing extending from surface through the tubular element, to the expansion assembly.

15. The method of any one of claims 11-14, whereby the expansion assembly is operable to selectively expand the tubular element to a first inner diameter and to a second inner diameter larger than the first inner diameter, and wherein the expansion assembly is operated to expand a lower end part of said lower portion of the tubular element to the second inner diameter and to expand the remainder of said lower portion to the first inner diameter.

16. The method of any one of claims 11-15, whereby the expansion assembly is provided with a cutter for cutting the tubular element or a break-out device for unscrewing a threaded connector of the tubular assembly, and wherein each step c) comprises, after expanding said lower portion of the tubular element operating the cutter to cut the tubular element, or operating the break-out device to unscrew a selected threaded connection of the tubular element, so as to separate said upper portion of the tubular element from said lower portion thereof.

17. The method of claim 16, whereby the cutter or the break-out device is axially spaced upwardly from an expander of the expansion assembly, whereby said lower portion of the tubular element has a substantially unexpanded upper end part, and wherein the cutter is operated to cut the tubular element at said substantially unexpanded upper end part.

23. 05. 2005

18. The method of claim 17, further comprising after <sup>(75)</sup> cutting the tubular element, or unscrewing the selected threaded connection of the tubular element, further operating the expansion assembly so as to expand said upper end part of the lower portion of the tubular element.

19. A drilling assembly for use in the method of any one of claims 1-18, the drilling assembly being of a size allowing the assembly to be moved through the tubular element when unexpanded, the drilling assembly comprising a drill bit, a downhole motor arranged to drive the drill bit, and movement means for moving the drilling assembly through the tubular element, wherein said movement means comprises a connection member for connecting a wireline extending from surface through the tubular element, to the drilling assembly, wherein the drilling assembly further comprises anchoring means for anchoring the drilling assembly in the tubular element such that the drilling assembly at least partly extends below the tubular element, characterized in that the anchoring means is adapted to anchor the drilling assembly in an upper portion of the tubular element after separating said upper portion from a lower portion of the tubular element.

20. The drilling assembly of claim 19, wherein the drilling assembly is located in the tubular element, and wherein a wireline extending from surface through the tubular element, is connected to said connection member.

21. The drilling assembly of claim 19, wherein the anchoring means is radially retractable so as to release the drilling assembly from the tubular element upon radial retraction of the anchoring means.

22. An expansion assembly for use in the method of any one of claims 1-18, the expansion assembly being operable between a radially expanded mode in which the expansion assembly has a diameter larger than the inner diameter of the tubular element when unexpanded, and a radially retracted mode in which the expansion assembly has a diameter smaller than the inner diameter of the tubular element when unexpanded, and wherein the expansion assembly comprises actuating means arranged to move the expansion assembly from the radially retracted mode to the radially expanded mode thereby expanding the tubular element when the expansion assembly is positioned in the tubular element, wherein the expansion assembly further comprises progressing means for axially progressing the expansion assembly through the tubular element, the progressing means comprising a connector member for connecting a wireline extending from surface through the tubular element, to the expansion assembly.

23. The expansion assembly of claim 22, wherein the expansion assembly is located in the tubular element, and wherein a wireline extending from surface through the tubular element, is connected to said connector member of the expansion assembly.

24. The expansion assembly of claim 22 or 23, wherein the expansion assembly is selectively operable to expand the tubular element to a first inner diameter and to a second inner diameter larger than the first inner diameter.

25. The expansion assembly of any one of claims 22-24, comprising a cutter for cutting the tubular element.

26. The expansion assembly of claim 25, whereby the cutter is axially spaced upwardly from an expander of the expansion assembly.

27. The method substantially as described hereinbefore with reference to the accompanying drawings.

28. The drilling assembly substantially as described hereinbefore with reference to the accompanying drawings.

5 29. The expansion assembly substantially as described hereinbefore with reference to the accompanying drawings.